Options for upgrading fan performance:

- **Centrifugal fans only**
  - **Add blade tips**
  - **Rotor retrofit at same speed**
  - **Rotor retrofit at higher speed**

- **All fans**
  - **Add booster fans**
  - **Replace existing fans with new fans**

ID fan upgrade issues to be considered:

- Is wheel tipping possible? (Lowest cost solution)
- Is a rotor retrofit possible?
- If simply adding a booster fan, is there sufficient real estate for the new fan, and its associated ductwork and controls?
- If installing completely new fans, are axials or centrifugals the best solution for my case?
- If centrifugal fans are chosen, what is the best means of controlling them?
- If installing new fans, will they fit on existing foundations?
- What is the necessary outage time for the conversion?
- What other costs will be involved, such as control systems, civil engineering work, ductwork additions or modifications, demolition of existing equipment, etc.

Rotor retrofit issues to be considered:

- **In all cases:**
  - Will the new wheel perform adequately in the old housing?
  - Do we need to perform a model test to verify estimated performance
  - Will housing modifications (inlets, VIV, cut-off) be excessive?
  - Is the existing housing in good condition?
  - Must the shaft or bearings and/or pedestals be replaced?
  - Is connecting ductwork adequate for the higher pressure?
- **For speed increases:**
  - Are the foundations suitable for the higher speed?
  - Will the higher vibration frequency excite other equipment in the vicinity?
  - Can the shaft be designed with adequate critical speed without choking the fan inlets?
  - Will there be erosion issues due to the higher fan speed?